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## Chapter Twenty-one

### GLOSSARY/INDEX

#### 21.1 GLOSSARY

##### 21.1.1 General

1. Accessible Route. An accessible route is a continuous, unobstructed path connecting all accessible elements and spaces in a building, site or facility. A "site" is defined as a parcel of land bounded by a property line or a designated portion of a public right-of-way. A "facility" is defined as all or any portion of buildings, structures, site improvements, complexes, equipment, roads, walks, passageways, parking lots, or other real or personal property on a site.
2. Arterial. Functionally classified highway which is characterized by a high degree of continuity and a capacity to quickly move relatively large volumes of traffic but often provide limited access to abutting properties. The arterial system typically provides for high travel speeds and the longest trip movements.
3. Average Running Speed. Running speed is the average speed of a vehicle over a specified section of highway. It is equal to the distance traveled divided by the running time (the time the vehicle is in motion). The average running speed is the distance summation for all vehicles divided by the running time summation for all vehicles.
4. Average Travel Speed. Average travel speed is the distance summation for all vehicles divided by the total time summation for all vehicles, including stopped delays. (Note: Average running speed only includes the time the vehicle is in motion. Therefore, on uninterrupted flow facilities which are not congested, average running speed and average travel speed are equal.)
5. Bicycle Lane. A portion of a roadway which has been designated by striping, signing and pavement markings for the exclusive use of bicyclists.
6. Bicycle Path. A bikeway physically separated from motorized vehicular traffic by an open space or barrier.
7. Bikeway. Any road, path or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or will be shared with other transportation modes.

8. Bridge. A structure, including supports, erected over a depression or obstruction, such as water, a highway, or a railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 6 m between undercopings of abutments or spring lines or arches or extreme ends of openings for multiple boxes; may include multiple pipes where the clear distance between openings is less than half of the smaller contiguous opening.
9. Bridge Length. The length of a bridge structure is the overall length measured from centerline of bearing to centerline of bearing of the abutments.
10. Bridge Roadway Width. The clear width of the structure measured at right angles to the center of the roadway between the bottom of curbs or, if curbs are not used, between the inner faces of parapet or railing.
11. Bridge to Remain in Place. An "existing bridge to remain in place" refers to any bridge work which does not require the total replacement of both the substructure and superstructure.
12. Bus. A heavy vehicle involved in the transport of passengers.
13. Collector. Functionally classified highway which is characterized by a roughly even distribution of their access and mobility functions.
14. Controlling Criteria. A list of geometric criteria requiring approval if they are not met or exceeded.
15. Crosswalk. (1) The part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs or, in the absence of curbs, from the edges of the traversable roadway. (2) Any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrians crossing by lines or other markings on the surface.
16. Department. The Montana Department of Transportation.
17. Design Exception. The process of receiving approval from the FHWA or Preconstruction Engineer for using design elements which do not meet the criteria set forth in the *State Geometric Design Standards* as control criteria and identified in this *Manual*.
18. Design Speed. Speed selected to establish specific minimum boundaries for the geometric design elements for a particular section of highway.

19. Divided Highway. A highway with separated roadways for traffic moving in opposite directions.
20. 85th Percentile Speed. The speed at or below which 85 percent of vehicles travel on a given highway.
21. Facility. All or any portion of buildings, structures, site improvements, complexes, equipment, roads, walks, passageways, parking lots, or other real or personal property on a site.
22. Freeway. The highest level of arterial. This facility is characterized by full control of access, high design speeds, and a high level of driver comfort and safety.
23. Frontage Road. A road constructed adjacent and parallel to but separated from the highway for service to abutting property and for control of access.
24. Full Control (Access Controlled). Access is allowed only at specified interchanges or at specified public approaches. It is intended to give high priority to the uninterrupted movement of through traffic. At-grade access is inconsistent with full access control.
25. Grade Separation. A crossing of two highways, or a highway and a railroad, at different levels.
26. Heavy Vehicle. Any vehicle with more than four wheels touching the pavement during normal operation. Heavy vehicles collectively include trucks, recreational vehicles and buses.
27. High Speed. For geometric design purposes, high speed is defined as greater than 70 km/h.
28. Highway, Street or Road. A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way. (Recommended usage: *in urban areas* - highway or street, *in rural areas* - highway or road).
29. Interchange. A system of interconnecting roadways in conjunction with one or more grade separations, providing for the movement of traffic between two or more roadways on different levels.
30. Intersection. The general area where two or more highways join or cross, within which are included the roadway and roadside facilities for traffic movements in that area.

31. Limited Access Control. Access is allowed at specified public roads or at private driveways as specified in legal agreements and/or deeds. The established street system is given first priority in access to the highway. When it is determined that reasonable private access cannot be provided using the public access, direct private access may be allowed at specific points.
32. Local Roads and Streets. All public roads and streets under city or county jurisdiction classified below the collector level.
33. Low Speed. For geometric design purposes, low speed is defined as 70 km/h or less.
34. National Highway System (NHS). A system of highways determined to have the greatest national importance to transportation, commerce and defense in the United States. It consists of the Interstate highway system, other principal arterials, the Strategic Highway Network and Major Strategic Highway Network connectors.
35. National Network (Trucks). A national network of highways that allow the passage of trucks of maximum dimensions and weight.
36. Non-Accessible Route. Any pedestrian facility which contains features that make it impractical to meet all of the criteria for accessible routes.
37. Operating Speed. Operating speed, as defined by AASHTO, is the highest overall speed at which a driver can safely travel a given highway under favorable weather conditions and prevailing traffic conditions while at no time exceeding the design speed. Therefore, for low-volume conditions, operating speed equals design speed.
38. Overpass. A grade separation where the subject highway passes over an intersecting highway or railroad.
39. Pace. The 15 km/h range of speeds in which the highest number of observations is recorded.
40. Posted Speed Limit. The regulatory speed limit on a highway.
41. Ramp. A short roadway connecting two or more legs of an intersection or connecting a frontage road and main lane of a highway.

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42. Recreational Vehicle. A heavy vehicle, generally operated by a private motorist, engaged in the transportation of recreational equipment or facilities; examples include campers, boat trailers, motorcycle trailers, etc.
43. Regulated Access. Access is managed through the granting of revocable permits to private parties to construct and maintain an approach. This level is intended to strike a balance between the through mobility on the highway and accessibility to adjacent land use.
44. Roadway. (General) The portion of a highway including shoulders, for vehicular use. A divided highway has two or more roadways. (Construction) The portion of a highway within limits of construction.
45. Running Speed. The moving speed of a vehicle traversing a specified section of highway. It is equal to the distance traveled divided by the running time (the time the vehicle is in motion).
46. Rural Areas. Those places outside the boundaries of urban areas.
47. Shared Roadway. A roadway which is open to both bicycle and motor vehicle travel.
48. Signalized Intersection. An intersection where all legs are controlled by a traffic signal.
49. Site. A parcel of land bounded by a property line or a designated portion of a public right-of-way.
50. State Highway. Any public highway planned, laid out, altered, constructed, reconstructed, improved, repaired, maintained or abandoned by the Montana Department of Transportation.
51. State Maintenance System. Public highways designated by the Transportation Commission that are to be included on the State Maintenance System. This system must include all the highways that the Department maintained on July 1, 1976.
52. Stopped Controlled Intersection. An intersection where one or more legs are controlled by a stop sign.
53. Surface Transportation Program (STP). A program which provides Federal-aid funds for any public road not functionally classified as a minor rural collector or a

local road or street. However, in Montana, this program only applies to the State's primary, secondary and urban systems.

54. Truck. A heavy vehicle engaged primarily in the transport of goods and materials, or in the delivery of services other than public transportation. For geometric design and capacity analyses, trucks are defined as vehicles with six or more tires.
55. Underpass. A grade separation where the subject highway passes under an intersecting highway or railroad.
56. Urban Areas. Those places within boundaries set by the responsible State and local officials having a population of 5000 or more.

#### 21.1.2 Qualifying Words

1. Acceptable. Design criteria which do not meet desirable values, but yet is considered to be reasonable and safe for design purposes.
2. Criteria. A term typically used to apply to design values, usually with no suggestion on the criticality of the design value. Because of its basically neutral implication, this Manual frequently uses "criteria" to refer to the design values presented.
3. Desirable, preferred. An indication that the designer should make every reasonable effort to meet the criteria and that he/she should only use a "lesser" design after due consideration of the "better" design.
4. Guidance. This category is considered to be advisory usage, recommended but not mandatory. Deviations are allowed where engineering judgment indicates that it is appropriate. The *MUTCD* prints this criteria in italics. Typical phrases include should, should be, should be considered, should be given, etc.
5. Guideline. Indicating a design value which establishes an approximate threshold which should be met if considered practical.
6. Ideal. Indicating a standard of perfection (e.g., traffic capacity under "ideal" conditions).
7. Insignificant, minor. Indicating that the consequences from a given action are relatively small and not an important factor in the decision-making for geometric design.



8. Justified. Indicating that, even though a set of conditions or warrants are met, the recommendation meets sound engineering principles.
9. May, could, can, suggest, consider. A permissive condition. Designers are allowed to apply individual judgment and discretion to the criteria when presented in this context. The decision will be based on a case-by-case assessment.
10. Minimum, maximum, upper, lower (limits). Representative of generally accepted limits within the design community but not necessarily suggesting that these limits are inviolable. However, where the criteria presented in this context will not be met, the designer will in many cases need approval.
11. Option. This category includes procedures and devices that are allowed, but carry no recommendations or mandate. The user is free to use or refrain from their use. Typical phrases include may, may be used, may be considered, etc.
12. Policy. Indicating MDT practice which the Department generally expects the designer to follow, unless otherwise justified.
13. Possible. Indicating that which can be accomplished. Because of its rather restrictive implication, this word will not be used in this *Manual* for the application of geometric design criteria.
14. Practical, feasible, cost-effective, reasonable. Advising the designer that the decision to apply the design criteria should be based on a subjective analysis of the anticipated benefits and costs associated with the impacts of the decision. No formal analysis (e.g., cost-effectiveness analysis) is intended, unless otherwise stated.
15. Shall, require, will, must. A mandatory condition. Designers are obligated to adhere to the criteria and applications presented in this context or to perform the evaluation indicated. For the application of geometric design criteria, this *Manual* limits the use of these words.
16. Should, recommend. An advisory condition. Designers are strongly encouraged to follow the criteria and guidance presented in this context, unless there is reasonable justification not to do so.
17. Significant, major. Indicating that the consequences from a given action are obvious to most observers and, in many cases, can be readily measured.
18. Standard. (Geometrics) Indicating a design value which cannot be violated. This suggestion is generally inconsistent with geometric design criteria.

Therefore, "standard" will not be used in this *Manual* to apply to geometric design criteria (*MUTCD*). These are mandatory actions that are required without exception or with exceptions so noted under the standard heading. The *MUTCD* prints this criteria in bold print. Typical phrases include shall, shall mean, shall be satisfied, shall consist, etc.

19. Support. This category includes all introductory or explanatory language. It may occur before, within or after any of the above categories. The *MUTCD* prints this information in normal print. Typical phrases include is, are, warrants, considered, required, etc.
20. Target. If practical, criteria the designer should be striving to meet. However, not meeting these criteria will typically not require a justification.
21. Warrant. Indicating that some threshold or set of conditions have been met. Note that, once the warranting threshold has been met, designers are obligated to adhere to the criteria and applications presented in this context or to perform the evaluation indicated. Therefore, this Manual limits the use of this word.

### 21.1.3 Abbreviations

1. AASHTO. American Association of State Highway and Transportation Officials.
2. ADA. Americans with Disabilities Act.
3. ANSI. American National Standards Institute.
4. APWA. American Public Works Association.
5. AREA. American Railway Engineering Association.
6. ASCE. American Society of Civil Engineers.
7. ASTM. American Society of Testing and Materials.
8. COE. Corps of Engineers, USDOD.
9. FAA. Federal Aviation Administration.
10. FEMA. Federal Emergency Management Agency.
11. FHWA. Federal Highway Administration, USDOT.

12. HAER. Historic American Engineering Record.
13. HCM. *Highway Capacity Manual*.
14. HEC. Highway Engineering Circulars and Hydraulic Engineering Center, USDOD, COE, Davis California.
15. ITE. Institute of Transportation Engineers.
16. ISTEA. Intermodal Surface Transportation Efficiency Act of 1991.
17. MDEQ. Montana Department of Environmental Quality.
18. MDFWP. Montana Department of Fish, Wildlife and Parks.
19. MDPHHS. Montana Department of Public Health and Human Services.
20. MDT. Montana Department of Transportation.
21. MEPA. Montana Environmental Policy Act.
22. MUTCD. *Manual on Uniform Traffic Control Devices*.
23. NCHRP. National Cooperative Highway Research Program.
24. NEPA. National Environmental Policy Act.
25. NHS. National Highway System.
26. NPS. National Park Service.
27. NRHP. National Register of Historic Places.
28. OSHA. Occupational Safety and Health Administration.
29. Q. Discharge or flow; typically in cubic meters per second.
30. R/W. Right-of-way.
31. RTF. Reconstruction Trust Fund.
32. SHPO. State Historic Preservation Officer.
33. STP. Surface Transportation Program.

- 34. TEA-21. Transportation Equity Act for the 21<sup>st</sup> Century.
- 35. TRB. Transportation Research Board.
- 36. USDOD. United States Department of Defense.
- 37. USDOT. United States Department of Transportation.
- 38. USFS. United States Forest Service.
- 39. USPS. United States Postal Service.

#### **21.1.4 Project/Plan Development**

- 1. Alignment Review. A meeting to determine and address the major project alignment concerns.
- 2. Alignment Review Report. A report which provides written documentation of the horizontal and vertical alignment determinations made during the preliminary alignment review.
- 3. Area Project Supervisor. The person who is responsible for the design of a project.
- 4. Award. The acceptance by the Department of a bid.
- 5. CADD. Computer-aided drafting and design.
- 6. Consultant. A firm or person, hired by MDT to conduct special studies, design projects, and/or construction management.
- 7. Contractor. A company or firm hired by MDT to construct the project in the field according to the plans and specifications.
- 8. Designer. The person who performs the majority of the project design work and preparation of the specific plan package. Depending upon the project type, the designer may be from the Bridge Bureau, Road Design Section, Traffic Engineering Section or the Consultant.
- 9. Engineer's Estimate. The Department's cost estimate for construction of a project.

10. Letting (Bid Opening). The time appointed for the opening of the proposals submitted by bidders.
11. MDT Detailed Drawings. Drawings approved for repetitive use, showing details to be used where appropriate.
12. Notice to Proceed. Written notice given to the contractor to begin the contract work.
13. Plan-in-Hand Review. An in-depth office and on-site review of all project elements to ensure that all details have been satisfactorily incorporated into the construction plans and that the project is ready to advance to construction.
14. Plan-in-Hand Report. A report which provides written documentation of all decisions made during the plan-in-hand office and field review meetings.
15. Plans. The contract drawings which show the location, character and dimensions of the prescribed work, including layouts, profiles, cross sections and other details.
16. Preliminary Field Review. An initial field review meeting held after a project has been nominated to determine the major design features, and to discuss other project-related issues and any potential problems.
17. Preliminary Field Review Report. A report which provides written documentation of all major determinations made during the preliminary field review meeting.
18. Project. An undertaking by the Department for highway construction, including preliminary engineering, acquisition of right-of-way and actual construction, or for highway planning and research, or for any other work or activity to carry out the provisions of the law for the administration of highways.
19. Proposal. The written offer of the bidder to perform the work described in the plans and specifications, and to furnish the labor and materials at the prices quoted by the bidder.
20. Public Hearing/Meeting. A meeting conducted by MDT to inform the general public on the Department's proposed plan of action or design proposal.
21. Quantity Summaries. A listing of the project construction quantities which are used by both the Department and the contractor for determining the project construction costs.

22. Scope-of-Work Report. A report that identifies the proposed design elements and major design features of the subject project, provides an overview of the project improvements and lists all approved design exceptions.
23. Special Provisions. Additions and revisions to the Standard and Supplemental Specifications applicable to an individual project.
24. Specifications. The compilation of provisions and requirements for the performance of prescribed work.
25. Standard Specifications. *Standard Specifications for Road and Bridge Construction*. A book of specifications approved for general application and repetitive use.
26. Supplemental Specifications. Approved conditions and revisions to the Standard Specifications.

#### **21.1.5 Planning**

1. Annual Average Daily Traffic (AADT). The total yearly volume in both directions of travel divided by the number of days in a year.
2. Average Daily Traffic (ADT). The total traffic volumes in both directions of travel in a time period greater than one day but less than one year divided by the number of days in that time period.
3. Capacity. The maximum number of vehicles which can reasonably be expected to traverse a point or uniform section of a road during a given time period under prevailing roadway, traffic and control conditions. The time period most often used for analysis is 15 minutes.
4. Categorical Exclusion (CE). A classification for projects that will not induce significant environmental impacts or foreseeable alterations in land use, planned growth, development patterns, traffic volumes, travel patterns, or natural or cultural resources.
5. Delay. The primary performance measure on interrupted flow facilities, especially at intersections. For intersections, average delay is measured and expressed in seconds per vehicle.
6. Density. The number of passenger car equivalents (PCE) occupying a given length of lane.

7. Design Hourly Volume (DHV). The one-hour vehicular volume in both directions of travel in the design year selected for determining the highway design.
8. Directional Design Hourly Volume (DDHV). The highest of two directional volumes which combine to form the DHV.
9. Directional Distribution (D). The distribution by percent, of the traffic in each direction of travel during the DHV, ADT and/or AADT.
10. Environmental Assessment (EA). A study to determine if the environmental impacts of a project are significant, thus requiring the preparation of an EIS.
11. Environmental Impact Statement (EIS). A document which is prepared when it has been determined that a project will have a significant impact on the environment.
12. Equivalent Single-Axle Loads (ESAL's). The summation of equivalent 8165-kg single-axle loads used to combine mixed traffic to design traffic for the design period.
13. Finding of No Significant Impact (FONSI). A result of an EA that shows a project will not cause a significant impact to the environment.
14. Heavy-Vehicle Adjustment Factor. A factor used in capacity analyses to determine the equivalent flow rate, expressed in terms of passenger cars per hour per lane, of heavy vehicles (i.e., trucks, buses and RVs) in the traffic stream.
15. Level of Service (LOS). A qualitative concept which has been developed to characterize acceptable degrees of congestion as perceived by motorists.
16. New Construction. Horizontal and vertical alignment construction on new location.
17. Overlay and Widening. Work primarily intended to extend the service life of the existing facility by making cost-effective improvements to upgrade the highway. It may include full-depth pavement reconstruction for up to 50% of the project length and may include horizontal and vertical alignment revisions for up to 25% of the project length.
18. Peak-Hour Factor (PHF). A ratio of the volume occurring during the peak hour to the peak rate of flow during a given time period within the peak hour (typically, 15 minutes).

19. Project Scope of Work. The basic intent of the highway project which determines the overall level of highway improvement.
20. Rate of Flow. The equivalent hourly rate at which vehicles pass over a given point or section of a lane or roadway on which the volume is collected over a time interval less than one hour.
21. Reconstruction. Reconstruction of an existing highway mainline will typically include the addition of travel lanes, reconstruction of the existing horizontal and vertical alignment for more than 25% of the project length, and/or full-depth pavement reconstruction for more than 50% of the project length.
22. Service Flow Rate. The maximum hourly vehicular volume which can pass through a highway element at the selected level of service.
23. Truck Factor (T). A factor which reflects the percentage of heavy vehicles (trucks, buses and recreational vehicles) in the traffic stream during the DHV, ADT and/or AADT. For geometric design and capacity analysis, trucks are defined as vehicles with six or more tires.

#### **21.1.6    Geometrics**

1. Approach. A road providing access from a public way to a highway, street, road or to an abutting property.
2. Auxiliary Lane. The portion of the roadway adjoining the through traveled way for purposes supplementary to through traffic movement including parking, speed change, turning, storage for turning, weaving or truck climbing.
3. Axis of Rotation. The line about which the pavement is revolved to superelevate the roadway. This line will maintain the normal highway profile throughout the curve.
4. Back Slope. The side slope created by the connection of the ditch bottom, upward and outward, to the natural ground.
5. Barrier Curb. A longitudinal element, typically concrete, placed at the roadway edge for delineation, to control drainage, to control access, etc. Barrier curbs may range in height between 150 mm and 300 mm with a face steeper than 1 horizontal to 3 vertical.



6. Begin Curb Return (BCR). The point along the mainline pavement edge where the curb return of an intersection meets the tangent portion.
7. Broken-Back Curves. Two crest or sag vertical curves in the same direction separated by a short section of tangent (150 m or less).
8. Buffer. The area or strip, also known as a boulevard, between the roadway and a sidewalk.
9. Bus. A heavy vehicle involved in the transport of passengers.
10. Channelization. The directing of traffic through an intersection by the use of pavement markings (including striping, raised reflectors, etc.), medial separators or raised islands.
11. Comfort Criteria. Criteria which is based on the comfort effect of change in vertical direction in a sag vertical curve because of the combined gravitational and centrifugal forces.
12. Compound Curves. A series of two or more horizontal curves with deflections in the same direction and common points of curvature.
13. Corner Island. A raised or painted island used to channel the right-turn movement.
14. Critical Length of Grade. The maximum length of a specific upgrade on which a loaded truck can operate without experiencing a specified reduction in speed.
15. Cross Slope. The slope in the cross section view of the travel lanes, expressed as a percent, based on the change in vertical compared to the change in horizontal.
16. Cross Slope Rollover. The algebraic difference between the slope of the through lane and the slope of the adjacent pavement within the traveled way or gore.
17. CS. Curve to spiral, common point of circular curve and spiral of far transition.
18. Curb Cut. Any opening in a curb where the curb section is terminated.
19. Cuts. Sections of highway located below natural ground elevation thereby requiring excavation of earthen material.
20. Depressed Median. A median that is lower in elevation than the traveled way and designed to carry a certain portion of the roadway runoff.

21. Design Vehicle. The vehicle used to determine turning radii, off-tracking characteristics, pavement designs, etc.
22. Edge of Travel Lane (ETL). The line between the portion of the roadway used for the movement of vehicles and the shoulder. The edge of travel lane is the center line, when considering opposing traffic.
23. Edge of Traveled Way (ETW). The line between the portion of the roadway used for the movement of vehicles and the shoulder regardless of the direction of travel.
24. End Curb Return (ECR). The point along the minor roadway pavement edge where the curb return of an intersection meets the tangent portion.
25. Face of Curb. A distance of 0.15 m from the back of curb.
26. Farm Field Approaches. Revocable entrances to and/or from a field.
27. Fill Slope. A slope extending outward and downward from the hinge point to intersect the natural ground line.
28. Flush Median. A paved median which is level with the surface of the adjacent roadway pavement.
29. Gore Nose. The point where the paved shoulder ends and the sodded area begins as the ramp and mainline diverge from one another.
30. Grade Separation. A crossing of two highways, or a highway and a railroad, at different levels.
31. Grade Slope. The rate of slope between two adjacent VPI's expressed as a percent. The numerical value for percent of grade is the vertical rise or fall in meters for each 100 m of horizontal distance. Upgrades in the direction of stationing are identified as plus (+). Downgrades are identified as minus (-).
32. Gradient. The rate of slope between two adjacent vertical points of intersection (VPI) expressed as a percent. The numerical value for percent of grade is the vertical rise or fall in meters for each 100 m of horizontal distance. Upgrades in the direction of stationing are identified as plus (+). Downgrades are identified as minus (-).

33. Heavy Vehicle. Any vehicle with more than four wheels touching the pavement during normal operation. Heavy vehicles collectively include trucks, recreational vehicles and buses.
34. Hinge Point (Freeways). The point from which the fill height and depth of cut are determined. For fills, the point is located at the intersection of the inslope extension and the fill slope. For cuts, the hinge point is located at the toe of the back slope.
35. Hinge Point (Non-Freeways). The point from which the fill height and depth of cut are determined. For fills, the point is located at the intersection of the subgrade cross slope and the fill slope for tangent sections and the low side of superelevated sections. On the high side of superelevated sections, the point is located on the fill slope at a distance from the centerline equal to the distance from the centerline to the hinge point on the tangent section. For cuts, the hinge point is located at the toe of the back slope.
36. Inslope. The side slope in a cut section created by connecting the subgrade shoulder to the ditch bottom, downward and outward.
37. Interchange. A system of ramps in conjunction with one or more grade separations, providing for the movement of traffic between two or more roadways on different levels.
38. Intersection. The general area where two or more highways join or cross at grade.
39. Intersection Sight Distance (ISD). The sight distance required within the corners of intersections to safely allow a variety of vehicular access or crossing maneuvers based on the type of traffic control at the intersection.
40. Island. Channelization (raised or flush) in which traffic passing on both sides is traveling in the same direction.
41. K-Value. The horizontal distance needed to produce a 1% change in gradient.
42. Landing Area. The area approaching an intersection for stopping and storage of vehicles.
43. L<sub>C</sub>. Length of circular curve.

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44. Level Terrain. Level terrain is generally considered to be flat, and has minimal impact on vehicular performance. Highway sight distances are either long or could be made long without major construction expense.
45. L<sub>s</sub>. Length of spiral.
46. Low-Speed Urban Streets. These are all streets within urbanized and small urban areas with a design speed of 70 km/h or less.
47. Maximum Superelevation (e<sub>max</sub>). The overall superelevation control used on a specific facility. Its selection depends on several factors including overall climatic conditions, terrain conditions, type of facility and type of area (rural or urban).
48. Medial Separator. Channelization which separates opposing traffic flows, alerts the driver to the cross road ahead and regulates traffic through the intersection.
49. Median. The portion of a divided highway separating the two traveled ways for traffic in opposite directions. The median width includes both inside shoulders.
50. Median Opening. Openings in the median (raised or depressed) on divided facilities which allow vehicles to cross the facility or to make a U-turn.
51. Median Slope. The slope in the cross section view of a depressed median beyond the surfacing inslope, expressed as a ratio of the change in horizontal to the change in vertical.
52. Momentum Grade. A site where an upgrade is preceded by a downgrade, thereby allowing a truck to increase its speed on the upgrade. This increase in speed allows the designer to use a higher speed reduction in the critical length of grade figure.
53. Mountable Curb. A longitudinal element, typically concrete, placed at the roadway edge for delineation, to control drainage, to control access, etc. Mountable curbs have a height of 150 mm or less with a face no steeper than 1 horizontal to 3 vertical.
54. Mountainous Terrain. Longitudinal and transverse changes in elevation are abrupt. Benching and side hill excavation are frequently required to provide the desirable highway alignment. Mountainous terrain aggravates the performance of trucks relative to passenger cars, resulting in some trucks operating at crawl speeds.

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55. No Control Intersection. An intersection where none of the legs are controlled by a traffic control device.
  56. Normal Crown (NC). The typical cross section on a tangent section referenced to centerline with equal downslope to the edge of pavement.
  57. Open Roadways. Open roadways are all rural facilities regardless of design speed and all urban facilities with a design speed greater than 70 km/h.
  58. Painted Nose. This is the point (without width) where the pavement striping on the left side of the ramp converges with the stripe on the right side of the mainline traveled way.
  59. Parking Lane. An additional lane for the parking of vehicles.
  60. Passing Sight Distance. For geometric design applications, the distance required for a following vehicle to maneuver around, in the opposing traffic lane, a slower vehicle and to safely return back to the appropriate travel lane.
  61. Paved Walkway. That portion of the highway section constructed adjacent to facilities without curb and gutter, with a minimum of 1 m buffer area, for use by pedestrians.
  62. PC. Point of curvature (beginning of curve).
  63. PCC. Point of compound curvature.
  64. Performance Curves. A set of curves which illustrate the effect grades will have on the design vehicle's acceleration and/or deceleration.
  65. Physical Nose. This is the point where the ramp and mainline shoulders converge.
  66. PI. Point of intersection of tangents.
  67. PRC. Point of reverse curvature.
  68. Private Approach. An approach which allows access to and/or from a commercial, industrial or residential property.
  69. Profile Grade Line. A series of tangent lines connected by vertical curves. It is typically placed along the roadway centerline of undivided facilities and at the edges of the two roadways on the median side on divided facilities.

- 70. PT. Point of tangency (end of curve).
- 71. Public Approach. A connection to and/or from a dedicated street, road, alley or other dedicated public roadway to a highway facility.
- 72. Raised Median. A median which contains a raised portion or island within its limits.
- 73. Recreational Vehicle. A heavy vehicle, generally operated by a private motorist, engaged in the transportation of recreational equipment or facilities; examples include campers, boat trailers, motorcycle trailers, etc.
- 74. Relative Longitudinal Slope. The relative longitudinal slope is the difference between the centerline grade and the grade of the edge of traveled way.
- 75. Return. The circular segment of curb at an intersection which connects the tangent portions of the intersecting legs.
- 76. Reverse Crown (RC). A superelevated roadway section which is sloped across the entire traveled way in the same direction and at a rate equal to the cross slope on a tangent section.
- 77. Reverse Curves. These are two simple curves with deflections in opposite directions which are joined by a common point or a relatively short tangent distance.
- 78. Roadside. A general term denoting the area adjoining the outer edge of the roadway.
- 79. Roadway Section. The combination of the traveled way, both shoulders and any auxiliary lanes on the highway mainline.
- 80. Rolling Terrain. The natural slopes consistently rise above and fall below the roadway grade and, occasionally, steep slopes present some restriction to the desirable highway alignment. In general, rolling terrain generates steeper grades, causing trucks to reduce speeds below those of passenger cars.
- 81. SC. Spiral to curve, common point of spiral and circular curve of near transition.
- 82. Shelf. On curbed urban facilities without sidewalks, the relatively flat area (2% slope) located between the back of the curb and the break for the fill slope or back slope.

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83. Shoulder. The portion of the roadway contiguous to the traveled way for the accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses. On sections with curb and gutter, the shoulder extends to the face of the curb.
84. Shoulder Slope. The slope in the cross section view of the shoulders, expressed as a percent.
85. Shoulder Width. The width of the shoulder measured from the edge of traveled way to the intersection of the shoulder slope and surfacing inslope planes. On curb and gutter sections, the width of the shoulder is measured from the edge of the traveled way to the face of curb (a point 0.15 m in front of the back of curb).
86. Sidewalk. That portion of the highway section constructed for the use of pedestrians used in combination with curb and gutter.
87. Signalized Intersection. An intersection where all legs are controlled by a traffic signal.
88. Simple Curve. A curve that has a continuous arc of constant radius which achieve the necessary highway deflection without an entering or exiting transition.
89. Slope Offset. On curbed facilities with sidewalks, the area between the back of the sidewalk and the break for the fill slope or back slope.
90. Spiral Curve. A curvature arrangement used to transition between a tangent section and a simple curve which is consistent with the transitional characteristics of vehicular turning paths. When moving from the tangent to the simple curve, the sharpness of the spiral curve gradually increases from a radius of infinity to the radius of the simple curve.
91. Spline Curve. A curve drawn using a flexible template to meet field conditions.
92. Spline Grade. A grade developed using a flexible template to meet field conditions.
93. ST. Spiral to tangent, common point of spiral and tangent of far transition.
94. Stop Controlled Intersection. An intersection where one or more legs are controlled by a stop sign.

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95. Stopping Sight Distance (SSD). The sum of the distance traveled during a driver's perception/reaction or brake reaction time and the distance traveled while braking to a stop.
  96. Superelevation. The amount of cross slope or "bank" provided on a horizontal curve to help counterbalance the outward pull of a vehicle traversing the curve.
  97. Superelevation Rollover. The algebraic difference (A) between the superelevated traveled way slope and shoulder slope on the outside of a horizontal curve.
  98. Superelevation Runoff (L). The distance needed to change the cross slope from the end of the tangent runout (adverse crown removed) to a section that is sloped at the design superelevation.
  99. Superelevation Transition Length. The distance required to transition the roadway from a normal crown section to full superelevation. Superelevation transition length is the sum of the tangent runout (TR) and superelevation runoff (L) distances.
  100. Surfacing Inslope. The slope extending from the edge of shoulder to the subgrade shoulder point, expressed as a ratio of the change in horizontal to the change in vertical.
  101. Symmetrical Vertical Curve. A vertical curve where the horizontal distance from the VPC to the VPI equals the horizontal distance from the VPI to the VPT.
  102. Tangent Runout (TR). The distance needed to transition the roadway from a normal crown section to a point where the adverse cross slope of the outside lane or lanes is removed (i.e., the outside lane(s) is level).
  103. TS. Tangent to spiral, common point of spiral and near transition.
  104. Toe of Slope. The intersection of the fill slope or inslope with the natural ground or ditch bottom.
  105. Top of (Cut) Slope. The intersection of the back slope with the natural ground.
  106. Travel/Traffic Lane. The portion of the traveled way for the movement of a single line of vehicles.
  107. Traveled Way. The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.



108. Truck. A heavy vehicle engaged primarily in the transport of goods and materials, or in the delivery of services other than public transportation. For geometric design and capacity analyses, trucks are defined as vehicles with six or more tires.
109. Turn Lane. An auxiliary lane adjoining the through traveled way for speed change, storage and turning.
110. Turning Roadway. A channelized roadway (created by an island) connecting two legs of an at-grade intersection. Interchange ramps are not considered turning roadways.
111. Turning Template. A graphic representation of a design vehicle's turning path depicting various angles of turns for use in determining acceptable turning radii designs.
112. Unsymmetrical Vertical Curve. A vertical curve where the horizontal distance from the VPC to the VPI is not equal to the horizontal distance from the VPI to the VPT.
113. VPC (Vertical Point of Curvature). The point at which a tangent grade ends and the vertical curve begins.
114. VPI (Vertical Point of Intersection). The point where the extension of two tangent grades intersect.
115. VPT (Vertical Point of Tangency). The point at which the vertical curve ends and the tangent grade begins.
116. Yield Controlled Intersection. An intersection where one or more legs are controlled by a yield sign.

#### **21.1.7 Right-of-Way**

1. Abandonment. The relinquishment of the public interest in right-of-way activity thereon with no intention to reclaim or use again for highway purposes.
2. Access. A legal right to enter the through lanes of a highway facility from abutting property or public streets.

3. Access Control (Control of Access). The condition in which the right of owners or occupants of abutting land or other persons to access, light, air or view in connection with a highway is fully or partially controlled by a public authority.
4. Acquisition or Taking. The process of obtaining land and land interests.
5. Construction Permit. Temporary legal access acquired by the State, outside the permanent right-of-way boundaries, to construct the highway project according to its proper design but on property which is not owned by the State.
6. Farm Field Approaches. An approach to be used only for access to agricultural lands (farm fields) and no other purpose.
7. Full Access Control. Access is allowed only at specified interchanges or at specified public approaches. It is intended to give high priority to the uninterrupted movement of through traffic. At-grade access is inconsistent with full access control.
8. Improvement. Any dwelling, out-building, other structure or fence, or part thereof, but not including public utilities, which lie within an area to be acquired for highway purposes.
9. Limited Access Control. Access is allowed at specified public roads or at private driveways as specified in legal agreements and/or deeds. The established street system is given first priority in access to the highway. When it is determined that reasonable private access cannot be provided using the public access, direct private access may be allowed at specific points.
10. Limited Access Highway (or Facility). A portion of roadway with limited access control imposed by the governing public authority.
11. Permanent Right-of-Way. Highway right-of-way acquired for permanent ownership (fee simple title) by the State for activities which are the responsibility of the State for an indefinite period of time. The State obtains fee title to the property.
12. Permanent Right-of-Way Easements. A right for a specific purpose acquired by the State for the limited usage of property not owned by the State. Types of right-of-way easements may include maintenance easements, utility easements, storm sewer easements and roadway easements.
13. Private Approach. An approach which allows access to and/or from a commercial, industrial or residential property.

14. Public Approach. A connection to and/or from a dedicated street, road, alley or other dedicated public roadway to a highway facility.
15. Regulated Access. Access is managed through the granting of revocable permits to private parties to construct and maintain an approach. This level is intended to strike a balance between the through mobility on the highway and accessibility to adjacent land use.
16. Right of Access. The right of ingress to a highway from abutting land and egress from a highway to abutting land.
17. Right-of-Way. A general term denoting land, property or interest therein, usually a strip acquired for or devoted to a highway use.
18. Right-of-Way Appraisal. A determination of the market value of property including damages, if any, as of a specified date, resulting from an analysis of facts.
19. Right-of-Way Estimate. An approximation of the market value of property including damages, if any, in advance of an appraisal.
20. Severance Damages. Loss in value of the remainder of a parcel resulting from an acquisition.
21. Temporary Easement. Right-of-way acquired for the legal right of usage by the State to serve a specific purpose for a limited period of time (e.g., maintenance and protection of traffic during construction). Once the activity is completed, the State yields its legal right of usage and returns the land to its original condition as close as practical.

#### **21.1.8 Roadside Safety**

1. Barrier Warrant. A criterion that identifies an area of concern which should be shielded by a traffic barrier, if judged to be practical.
2. Critical Parallel Slope. A slope which cannot be safely traversed by a run-off-the-road vehicle. Depending on the encroachment conditions, a vehicle on a critical slope may overturn. For most embankment heights, a fill slope steeper than 3:1 is considered critical.

3. Edge of Travel Lane (ETL). The line between the portion of the roadway used for the movement of vehicles and the shoulder. The edge of travel lane is the center line, when considering opposing traffic.
4. Edge of Traveled Way. The line between the portion of the roadway used for the movement of vehicles and the shoulder regardless of the direction of travel.
5. Impact Angle. For a longitudinal barrier, the angle between a tangent to the face of the barrier and a tangent to the vehicle's path at impact. For a crash cushion, it is the angle between the axis of symmetry of the crash cushion and a tangent to the vehicular path at impact.
6. Impact Attenuator (Crash Cushion). A device used to safely shield fixed objects or other obstacles of limited dimension from approximately head-on impacts by errant vehicles.
7. Length of Need. Total length of a longitudinal barrier, measured with respect to the centerline of roadway, needed to shield an area of concern. The length of need is measured to the last point of full-strength rail.
8. Median Barrier. A longitudinal barrier used to prevent an errant vehicle from crossing the median of a divided highway. This prevents collisions between traffic traveling in opposite directions.
9. Non-Recoverable Parallel Slope. A slope which can be safely traversed but upon which an errant motorist is unlikely to recover. The run-off-the-road vehicle will likely continue down the slope and reach its toe. For most embankment heights, if a fill slope is between 3:1 (inclusive) and 4:1 (exclusive), it is considered a non-recoverable parallel slope.
10. Parallel Slopes. Cut and fill slopes for which the toe runs approximately parallel to the flow of traffic.
11. Recoverable Parallel Slope. A slope which can be safely traversed and upon which an errant motorist has a reasonable opportunity to stop and return to the roadway. A fill slope 4:1 and flatter is considered recoverable.
12. Roadside Barrier. A longitudinal barrier used to shield obstacles located within an established clear zone. Roadside barriers include guardrail, half-section concrete median barriers, etc.
13. Roadside Clear Zone. The total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. This area may consist of

a shoulder, a recoverable slope, a non-recoverable slope and/or a recovery area. The desired width is dependent upon traffic volumes, speeds and roadside geometry.

14. Roadside Obstacle. A general term to describe roadside features which cannot be safely impacted by a run-off-the-road vehicle. Roadside obstacles include both fixed objects and non-traversable roadside features (e.g., rivers).
15. Shy Distance. The distance from the edge of the traveled way beyond which a roadside object will not be perceived as an immediate hazard by the typical driver, to the extent that he will change vehicular placement or speed.
16. Transverse Slope. Cut and fill slopes for which the toe runs approximately perpendicular to the flow of traffic. Transverse slopes are typically formed by intersections between the mainline and approach, median crossovers or side roads.
17. Traversable Slope. A slope or cross section in which a vehicle can safely cross. A parallel slope 3:1 or flatter is considered traversable.
18. Utility Occupancy Area. A strip of right-of-way reserved for the placement of utilities.

#### **21.1.9 Drainage**

1. Allowable Headwater. The depth or elevation of the impoundment of cross-drainage flow above which damage or some other unfavorable result could occur.
2. Bridge. A structure including supports erected over a depression or an obstruction, such as water, highway or railway, and having a tract or passageway for carrying traffic or moving loads, and having an opening measured along the center of the roadway of more than 6 m between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes.
3. Catch Basin. A structure with a sump for inletting drainage from a gutter or median and discharging the water through a conduit. In common usage it is a grated inlet with or without a sump.
4. Channel. The bed and banks that confine the surface flow of a natural or artificial stream. Braided streams have multiple subordinate channels, which are within the main stream channel.

5. Cover. The extent of soil above the crown of a pipe or culvert.
6. Cross Drainage. The runoff from contributing drainage areas both inside and outside the highway right-of-way and the transmission thereof from the upstream side of the highway facility to the downstream side.
7. Culvert. A structure which is usually designed hydraulically to take advantage of submergence to increase hydraulic capacity. A structure used to convey surface runoff through embankments. A structure, as distinguished from bridges, which is usually covered with embankment and is composed of structural material around the entire perimeter, although some are supported on spread footings with the streambed serving as the bottom of the culvert.
8. Design Discharge or Flow. The rate of flow for which a facility is designed.
9. Design Flood Frequency. The recurrence interval that is expected to be accommodated without exceeding the adopted design constraints. The return interval (recurrence interval or reciprocal of probability) used as a basis for the design discharge.
10. Discharge. The rate of the volume of flow of a stream per unit of time, usually expressed in cubic meters per second.
11. Floodplain. The alluvial land bordering a stream, formed by stream processes, that is subject to inundation by floods.
12. Freeboard. The vertical distance between the level of the water surface, usually corresponding to design flow and a point of interest such as a low chord of a bridge beam or specific location on the roadway grade.
13. Headwater (Hw). That depth of water impounded upstream of a culvert due to the influence of the culvert construction, friction and configuration.
14. Hydraulics. The characteristics of fluid mechanics involved with the flow of water in or through drainage facilities.
15. Hydrology. The study of the occurrence, circulation, distribution and properties of the waters of the earth and its atmosphere.
16. Intensity. The rate of rainfall upon a watershed, usually expressed in meters per hour.

17. Peak Discharge. (1) The highest value of discharge attained by a flood. (2) Maximum discharge rate on a runoff hydro-graph for a given flood event.
18. Storm Drain Inlet. A structure for capturing concentrated surface flow. May be located along the roadway, in a gutter, in the highway median or in a field.
19. Time of Concentration ( $T_c$ ). The time it takes water from the most distant point (hydraulically) to reach a watershed outlet.  $T_c$  varies, but often used as constant.





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